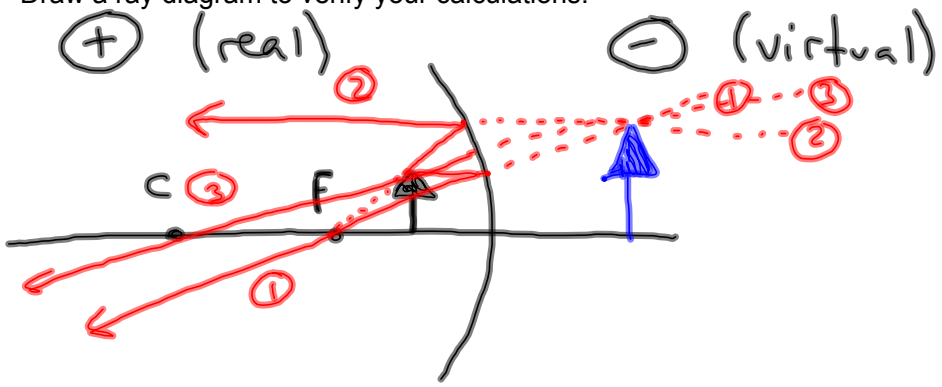
Test Wednesday

HW: p. 477: 34

p. 479: 49

p. 493: 1, 2 (practice A)

A concave makeup mirror is designed so that a person 25.0 cm in front of it sees an upright image at a distance of 50.0 cm behind the mirror. What is the radius of curvature of the mirror? What is the magnification of the image? Is the image real or virtual? Draw a ray diagram to verify your calculations.



$d_o = 25\ cm$ $\qquad R = 2f$

$d_i = -50\ cm$

$$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$$

$$f = 50\ cm$$

$$R = 2f = 100\ cm$$

$$M = -\frac{d_i}{d_o}$$

$$= 2$$

This image is upright, larger, virtual.

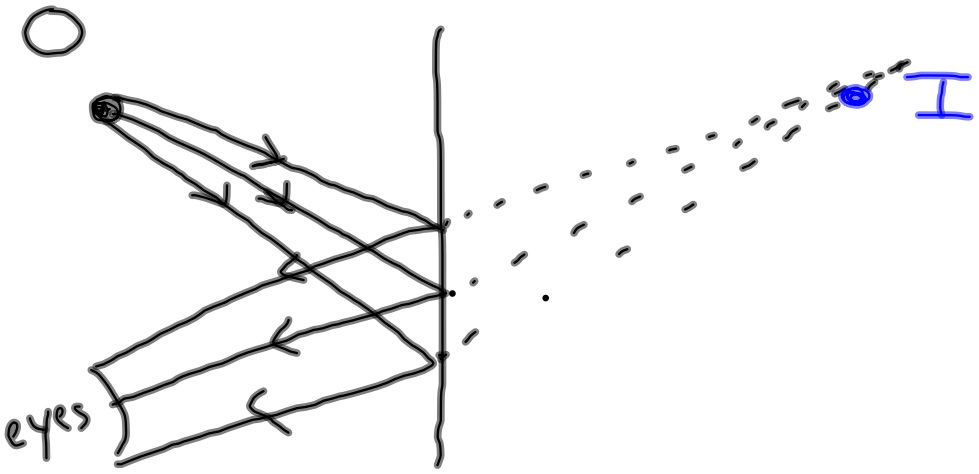
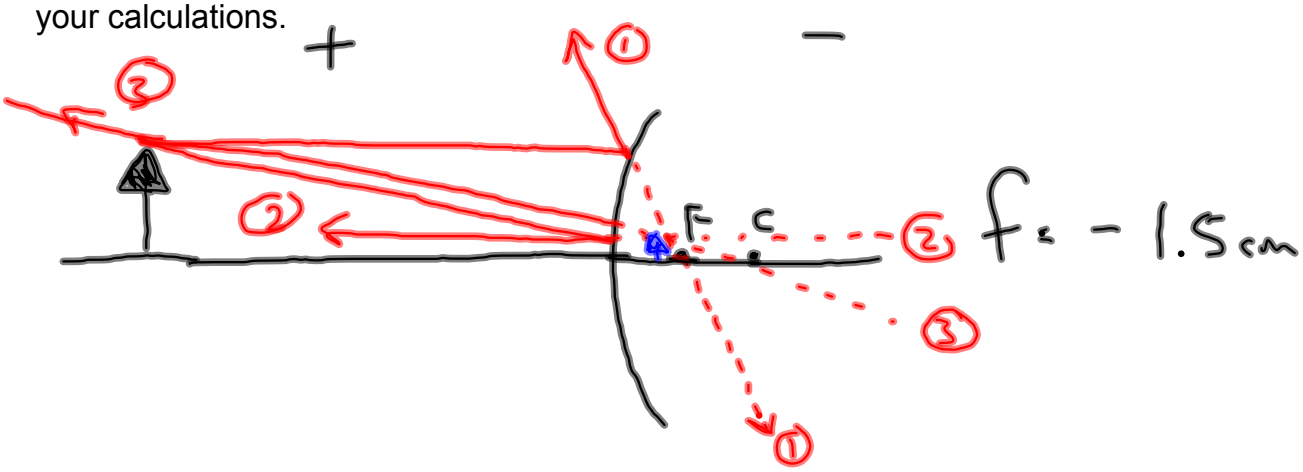


Image is a place where light rays either actually diverge or appear to diverge.

A spherical glass ornament is 6.00 cm in diameter. If an object is placed 10.5 cm away from the ornament, where will its image form? What is the magnification? Is the image virtual or real? Is the image inverted or upright? Draw a ray diagram to verify your calculations.



$d_o = 10.5\ cm$

$f = -1.5\ cm$

$$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$$

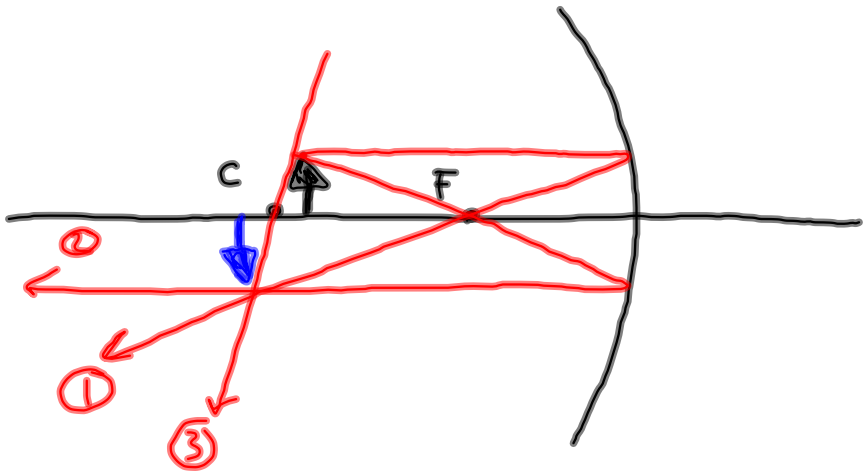
$$d_i = -1.31\ cm$$

$$M = -\frac{d_i}{d_o}$$

$$= 0.125$$

Image is upright, smaller, virtual.

A concave mirror has a focal length of 25.0 cm and an object is placed 45.0 cm away from the mirror. Where is the image formed? Is it inverted or upright, larger, smaller, or the same size? Draw a ray diagram to verify.



$$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$$

$d_o = 45\,cm$

$f = 25\,cm$

$$d_i = 56.3\,cm$$

$$M = -\frac{d_i}{d_o}$$

$$= -1.25$$

Image is real, inverted, larger.

Transmission (Refraction):

- Refraction:
  - bending of light as it goes from one medium to another
  - happens when the velocity of light changes

$$V = \lambda f$$

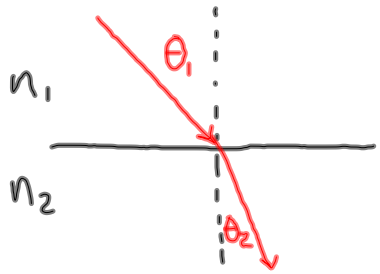
(λ: stays constant; f: changes)

- Index of refraction:

$$n = \frac{c}{v}$$

(c → speed of light in vacuum; v → speed of light in medium)

- Boundary → place where two media meet

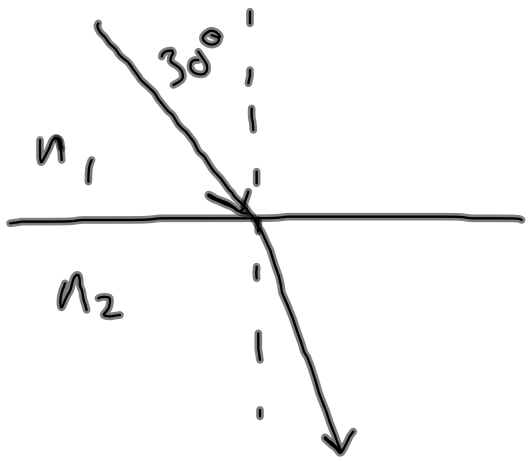


- Snell's Law:

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

- If wave goes from lower n to a higher n, then θ will decrease.
- If wave goes from higher n to a lower n, the θ will increase.

A light ray of wavelength 589 nm (produced by a sodium lamp) traveling through air strikes a smooth, flat slab of crown glass (n = 1.52) at an angle of 30.0 degrees to the normal. Find the angle of refraction.



$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

$$\theta_2 = \sin^{-1}\left[\frac{n_1}{n_2}\sin\theta_1\right]$$

$$= 19.2^\circ$$